

Cooperation between players and goalkeepers in ice hockey

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Teacher/s or supervisor/s Markus Arvaja & Mika Vähälummukka <p>The objective of this thesis is to provide instructional material for players and goalkeepers for more effective cooperation in variable defensive scenarios during an ice hockey game.</p> <p>The material is targeted for defenseman coaches, goalkeeper coaches, defensemen and goalkeepers. The objective of the video material is to illustrate how goalkeepers and defenseman can cooperate better in different defensive scenarios. The theory part of this thesis divides defensive playing in to different defensive scenarios and categories and explains how these different situations can be played successfully with cooperation between a goalkeeper and a defenseman.</p> <p>All the edited video and instructions are available from the hockey centre website managed by the International Ice Hockey Center of Excellence (IIHCE).</p> <p>The thesis is a product based thesis. The product is a video manual for the International Ice Hockey Centre of Excellence. The thesis project was started 2013 and finished 2014.</p>	
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Degree program

Table of contents

1. Introduction	1
2. Sport analysis of ice hockey	2
2.1. Game Analysis	2
2.2. Individual analysis.....	3
2.3. Hockey Sense	3
2.4. Game situation roles	3
2.5. Physical demands of ice hockey.....	5
3. Defensive objectives	6
3.1. Prevent scoring	6
3.2. Regain possession of the puck.....	7
3.3. Transition.....	7
4. Defensive cooperation between goalies and players	8
4.1. Defensive situations with even number of players.....	9
4.1.1. How to defend 1-on-1 rush	9
4.1.2. How to defend a 1-on-1 from the boards	10
4.1.3. How to defend a 1-on-1 situation from the corner.....	10
4.2. Defensive situations with uneven number of players.....	11
4.2.1. How to defend 2-on-1 rush	12
4.2.2. How to defend 2-on-1 coming from the corner	13
4.2.3. How to defend 3-on-2 rush	13
4.2.4. How to defend 3-on-1 rush	15
4.2.5. Penalty kill.....	16
4.3. Other defensive situations	17
4.3.1. A loose puck.....	17
4.3.2. Puck in the possession of the goalie behind the net	17
4.3.3. Goalie being screened.....	18
4.3.4. Goalie coming out aggressively	19
4.3.5. How to defend rebounds	19
5. Empirical work	20
5.1. Project planning.....	20

Degree program

5.2. Project implementation	21
6. Discussion	24
Bibliography.....	26

1. Introduction

How to create a successful defensive strategy in ice hockey? The key to success of any strategy in ice hockey lies in an excellent cooperation between the players who execute it. Cooperation by definition means a process of groups or individuals working or acting together for their common good. For this to happen, everybody must know their responsibilities in different situations during a game. Therefore we need educational material that is easily accessed by everyone involved in the cooperation. If your team members do not know how different defensive situations should be played and do not cooperate well during a game you can't expect success in your defensive play. Our goal was to create a tool that can help to improve the cooperation between goalkeepers and players.

We took video footage from Finland's U-20 national team games during the period of 2011-2012 to provide the most common defensive situations that players face on a regular basis in their defensive game. From the video footage we used material to make videos which illustrate players and goalies the way they should play and cooperate in different defensive situations. The focus of this project is mainly defensive playing where the main goal is to effectively prevent the opponent from scoring with the help of well-coordinated cooperation. Although there are some situations where we do take a look at the offensive game in the defensive zone, the main focus is on defense.

The goal of this project is to provide clear instructional material for the IIHCE website. With written instructions it is always hard to be specific enough what you mean and what you want people to do. That is the reason why the Ice Hockey Centre of Excellence wanted us to assemble an instructional video library on this subject. All of the material in this project has one purpose. Everything is designed to help players and goalies to improve cooperation between them in different defensive situations. We tried to make every single video and every line of text as simple and comprehensive as possible.

2. Sport analysis of ice hockey

This analysis will provide information on the requirements of ice hockey. The analysis is divided into five chapters. These chapters are game analysis, individual analysis, hockey sense, game situation roles and physical demands of ice hockey. The chapters will provide information on each topic and how they relate to ice hockey in the big picture (Vähä-Ruohola 2009).

Ice hockey is a sport that requires many different skills, from raw physical power to fine tuning on the mental side, as well as understanding the tactical aspects of the game. It requires explosive speed, endurance, strength, flexibility and agility. It is a sport where the athlete will have to rely heavily on both energy resources; aerobic and anaerobic (MacLean). The game lasts for 60 minutes which consists of three 20-minute periods with 15-minute intermissions between the periods. If we count all the breaks and stoppages in the game, the game usually lasts from two to three hours.

Ice hockey is a mix between long and short performances, stop and go, stillness and movement. The main sport specific technical skills required are skating, shooting, passing, body checking, stick checking and understanding the game. These technical skills combined with the required physical skills and hockey sense creates a set of playing skills which a player has to possess to compete in high level hockey. Ice hockey is such a fast game that the player needs good reactions inside game situations to make the right decisions (Vähä-Ruohola 2009).

2.1. Game Analysis

Hockey is simply said a goal scoring game, the team which scores more goals, wins the game. The main goals during a game are to score a goal and to prevent the opponent from scoring a goal. These goals divide the game in two different situations: offensive game and defensive game, and these can be further divided in smaller pieces of game situations and individual game situation roles. Teams which are succeeding well have a really good and organized system where every player has their own defined role and that role usually depends on the players individual playing skills. Different types of players will create good combinations and different playing skills are needed in different game situation roles (Pesola 2009).

2.2. Individual analysis

Technical skills are the foundation of playing skills. Without excellent technical skills a player will have limitations in his overall game. A player with excellent technical skills will have the tools to play the game. Ice hockey coaches should spend much time on developing technical skills when children join the ice hockey team. Practices should be fun and include a high amount of repetitions to learn the techniques in skating, passing & receiving, puck control, and shooting correctly, these mentioned skills are the most important technical skills (Manners 2004, 16).

Skating includes forward skating, backward skating, cross over's, turns, stops and starts and it is the most important of all skills. Passing includes puck control, deception, moving, puck protection and readiness. Shooting includes wrist shots, slap shots, back hand shots, tips and deflections and also rebounds (Manners 2004, 10).

2.3. Hockey Sense

Hockey requires not only technical skills, but also a high level of knowledge and an understanding of the game itself. A player with great hockey sense has cognitive expertise in the tactical field of the game. Hockey sense includes understanding the game, reading the game and making decisions. To play the game effectively a player must understand the rules and objectives of the game and the action principles in different situations. When he understands the game and sees the game he can read and react to the current game situation. Based on that understanding and reading he can make the right decisions and use his playing skills during the game for the advantage of his team (Pesola 2009).

2.4. Game situation roles

During the game a player is in one of four different roles while playing, which are commonly known as game situation roles. In Finnish ice hockey, game situation roles have been under discussion for the past twenty years, and many coaches have discussed if the players understand these roles or not, and whether coaches should talk about them and teach them or not. The truth is that game situation roles are and will be

present in every ball game, when the amount of players on the field is two or more on each side (Huovinen 2009).

As mentioned in the beginning of the chapter the main purpose is to score and prevent the opponent from scoring. The roles are the same in every ball game where the ball can be carried or caught across the line (e.g. Rugby league, American football), it can be thrown or shot into a target (e.g. netball, basketball, handball, lacrosse) or it can be struck with a stick or foot into a target area (e.g. football, rinkball, ice hockey, floorball) (Huovinen 2009).

The game-situation roles in offensive play are puck carrier (role1) and non-puck carrier (role2). In defensive play the roles are defense against the puck carrier (role3) and defense against the non-puck carrier (role4). Players may not always understand the coaches' talk about game-situation roles, but for the coach, knowledge of game-situation roles and skills is essential. To know all situations taking place in a game gives the coach a picture of the different skills and tasks he needs to teach his players. On the individual level, the speed of changing roles from offense to defense or vice versa, and from puck carrier to non-puck carrier cultivates a developed hockey sense and individual game speed (Pesola 2009).

Offensive skills in game situation roles are:

- scoring
- creating space
- winning space
- puck possession
- defensive readiness

Defensive skills in game situation roles are:

- prevent scoring
- take away space
- stealing the puck and regaining the possession of the puck
- offensive readiness

2.5. Physical demands of ice hockey

Ice hockey is a sport where the player will have to rely on both energy systems; aerobic and anaerobic. Some studies indicate that ice hockey players use the anaerobic system more than the aerobic system during the game. A player is using mainly ATP, KP and anaerobic glycolysis during the shifts, if the shift lasts from 10 – 45 seconds. After 45 seconds players start to feel muscular fatigue and the players start to rely heavily on their lactates. Although during more moderate times during a game, a player is relying more on the aerobic system. A well-trained aerobic system helps players to recover faster between the shifts and during the intermissions (Simenz, Ebben & Carroll).

3. Defensive objectives

Defensive objectives is a large subject and this chapter is not going into details of different team play objectives in defensive play, but it will cover the main objectives that every team should know and pay attention to. The most simplified definition of defense is of course to prevent the opponent from scoring. Although that is the main objective in defense, it is too big of a concept to execute. That is why team play objectives in defense have to be concrete instructions that every player can understand and execute. There are of course different ways to play defense and therefore different teams have different defensive strategies. Despite the differences, all ice hockey teams have defensive objectives for different zones on the ice.

The most common way to break team defense is to break it into main defensive objectives in different parts of the ice. These main objectives are defensive game in the defensive zone, defensive game in the neutral zone and defensive game in the offensive zone. All of these main objectives can of course be divided into even smaller categories and objectives, all the way down to how a certain player should play a defensive situation in a certain part of the ice. Although there are different defensive objectives in different parts of the ice, there are common anomalies between these main objectives that players are trying to execute (Martikainen 2011, 15.)

3.1. Prevent scoring

Preventing the opponent from scoring is the most important task in defense. Preventing the opponent from scoring comes from a defensive cooperation between the defensive players and the goalie. There are different ways to prevent scoring. The defensive team's objective is to keep the opponent's puck carrier away from a good scoring sector. Players can block shots with their stick or body and if the puck goes to the net, then the goalie can make a save and prevent the scoring from happening (Martikainen 2011, 15).

3.2. Regain possession of the puck

One major objective in defense is trying to obtain the possession of the puck when it is not under your control. The players and goalies ability to read the game situation, react to it and cooperate correctly is vital in regaining possession of the puck. Your players need to limit opponents passing and shooting options with the help of active body and stick checking. Body and stick checking enables your players to separate the opponent from the puck and therefore creates a loose puck situation. A loose puck gives the defensive team a chance to regain the possession of the puck. When the possession of the puck has been regained, it is time to make the transition from defense to offense (Martikainen 2011, 17).

3.3. Transition

When a team has regained possession of the puck, it has made the transition from defense to offense. The transition is a crucial moment in a hockey game, because during this situation players or goalies need to read the game, recognize the situation and respond correctly. After regaining the possession of the puck, the players need to read the game situation, react to it and cooperate correctly. The main goal after a transition is to attack against an unorganized defense. If the transition is quick enough, it can lead to an odd man rush against an unorganized defense. Attacking against unorganized defense is easier than attacking against a well-organized 5-on-5 defense. This is why the defensive team tries to quickly turn the defense in to an offense. There are also times when a quick attack it is not the best option after a transition. In these situations the team holds the puck and breaks out against the opponents organized defense (Martikainen 2011, 18).

4. Defensive cooperation between goalies and players

Knowledge is the foundation for any success in the cooperation between players and goalies. Players and goalies need to know this material thoroughly, because there is no time to think twice about your actions during the game. The knowledge of this material is also imperative when practicing. You cannot practice efficient cooperation with your team if you don't know what your responsibilities are. Key-points are repetition, good communication and evaluation as is explained in the following paragraphs.

Repetition is the key to learning. You need to rehearse these situations with your players and goalies. You cannot expect them to play these situations correctly, if they have not practiced them enough. When the players and goalies have practiced the situations enough, then they can identify the different situations from one another and respond to them correctly.

Good communication is imperative for any successful cooperation between people. Establish the language and the instructions that players and goalies will use; when using instructions on ice, use short and informative instructions because there is no time for long discussions. It is also important to know who will be giving the instructions in different situations. In most of the defensive situations it is the goalie who instructs the player, but there are some cases where the player instructs the goalie (Suomen jääkiekkoliitto 2006).

Evaluate the cooperation. You need to evaluate how well the cooperation is working between the players and the goalies. The evaluation process is a fundamental part of improving cooperation. It is also important that players and goalies discuss with themselves how the cooperation is working, and how it could be improved (Suomen jääkiekkoliitto 2006).

triangles represent the opponents. Blue circle with G inside = goalie; blue circle with Rd inside = right defensemen; blue circle with Ld inside = left defensemen; blue circle with C inside = center forward; blue circle with Rw inside = right wing forward; blue circle with Lw inside = left wing forward; red triangle with Rd inside = right defensemen; red triangle with Ld inside = left defensemen; red triangle with C inside = center forward; red triangle with Rw inside = right wing forward; red triangle with Lw inside = left wing forward.

4.1.2. How to defend a 1-on-1 from the boards

In defending 1-on-1 from the boards the defensive player's main goal is to stay in front of the offensive player, positioning himself between the offensive player and his own goal. The defensive player is trying to prevent the offensive player from getting around him to the net for a shot. The defensive player is also trying to create a loose puck with aggressive stick checking. He should also be aware of his surroundings, because if he can create a loose puck, he should be able to breakout quickly (Suomen jääkiekkoliitto 2006).



Figure 2. How to defend 1-on-1 from the boards (Suomen jääkiekkoliitto 2006)

4.1.3. How to defend a 1-on-1 situation from the corner

Defending 1-on-1 rush the defensive players main goal is to stay in front of the offensive player, preventing the offensive player from getting around him to the net for a shot. The player should actively stick check the opponent in order to create a loose puck. He should also be aware of his surroundings, if there is a loose puck and a chance to make a turnover and breakout (Suomen jääkiekkoliitto 2006).

The goalie's responsibility is to give the defensive player instructions for example how aggressive he should play the situation and if there are any other offensive players he should be aware of. The goalie should be aware of his positioning and if there is room in the goal when he is in butterfly stance or in high knee post. If the offensive player is in a small scoring sector, the goalie should try to play the situation from an upright position and avoid going down on butterfly too early (Suomen jääkiekkoliitto 2006).



Figure 3. How to defend a 1-on-1 situation from the corner (Suomen jääkiekkoliitto 2006)

4.2. Defensive situations with uneven number of players

Defending against an odd man attack is always different from defending against an attack with an equal amount of players on both sides. In these situations you can't defend the way you usually do. You can't directly defend your own player because you are outnumbered. This is why it is crucial for the team to know certain golden rules that you can apply in these situations (Suomen jääkiekkoliitto 2006).

Players should avoid playing aggressively against the puck carrier. In most of the odd man situations you try to limit the puck carrier's options and try to guide him to the side away from a good scoring sector. You should also try to prevent cross ice passes from happening. It is more beneficial for the defending player to allow the puck carrier to shoot from a small angle than to allow the attacker to make a cross ice pass that might lead in to a one timer (Suomen jääkiekkoliitto 2006).

Goalie should play odd man situations with moderation. There is a risk that if the goalie plays these situations very aggressively, he might get played out by the opponents cross ice passes. The goalie is also responsible of seeing the puck at all times, he makes the save and controls any loose pucks if necessary. The goalie has to be aware of all the opponents players on the ice at all times. He needs to know where the offensive players are located and preferably even which side they shoot from. The goalie gives the players instructions how he wants these situations to be played. He gives the instructions with short pre agreed commands (Suomen jääkiekkoliitto 2006).

4.2.1. How to defend 2-on-1 rush

The defensive player tries to limit the puck carriers options and to slow down the speed of the attack. The defensive player's main goal is to prevent a pass between the offensive players and to provide some level of pressure on the puck carrier, and he tries to force the puck carrier into a bad-shooting angle, preferably outside the slot area. The defensive player should position himself between the two offensive players so that it is easy for him to intercept any possible cross ice passing attempts (Suomen jääkiekkoliitto 2006).

The goalies responsibility is to give the defensive player instructions. The goalie informs the defensive player if he should give pressure to the puck carrier, or if the player should only try to prevent a cross ice pass and at the same time keeping the puck carrier in a small scoring sector. The goalie plays this situation conservatively and does not come out aggressively. His first responsibility is to play against the puck carrier and take the possible shot out. The goalie should also pay attention to the second offensive player, and be aware of his position all the time (Suomen jääkiekkoliitto 2006).



Figure 4. How to defend 2-on-1 rush (Suomen jääkiekkoliitto 2006)

4.2.2. How to defend 2-on-1 coming from the corner

The defensive player keeps the non-puck carrier off the puck. He should position himself so that he is in the middle of the players and can see them both. His main responsibility is to keep the non-puck carrier off the puck. The defensive player positions himself between the offensive players. He uses his stick to interfere the puck carrier so that the puck carrier can't skate from the corner in to a good scoring sector with the puck (Suomen jääkiekkoliitto 2006).

The goalie's main responsibility is the puck carrier and the possible shot that he might take. He should also be aware of the positioning of the non-puck carrier in case of a pass, the goalie needs to know the movements of the other attacker. The goalie uses his stick to intercept any passing attempts cross the ice that are happening close to the goal (Suomen jääkiekkoliitto 2006).

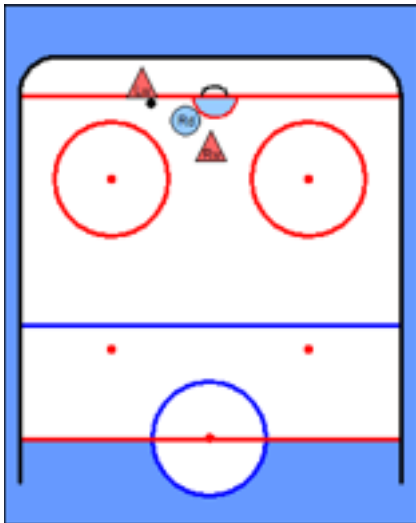


Figure 5. How to defend 2-on-1 coming from the corner (Suomen jääkiekkoliitto 2006)

4.2.3. How to defend 3-on-2 rush

The defensive players are trying to give the wingers enough pressure to keep them in a small scoring sector and try to prevent a pass to the third attacker. The first defensive player plays close to the puck carrier trying to force the puck carrier into a bad-shooting angle, outside the slot area. At the same time he is using his stick to prevent a pass

to the third offensive player who is coming from behind. The second defensive player plays close to the other winger (non-puck carrier). His job is to intercept any passes coming across the ice. If the puck is played to the third offensive player coming from behind, then both defensive players take the wingers out preventing them from defecting and getting to the rebounds and leave the point man with the puck to the goalie (Suomen jääkiekkoliitto 2006).

The goalie's responsibility is to give the defensive players instructions. The goalie informs the defensive players if they should give pressure to the puck carrier, or if they should just try to prevent a cross ice pass at the same time while keeping the puck carrier in a small scoring sector. The goalie should not play 3-on-2 aggressively, but remain inside the goal crease. His first responsibility is to play against the puck carrier. The goalie should also pay attention to the non-puck carriers, and be aware of their positioning at all times. If the puck is played to the point, then the goalie comes out aggressively and plays against the shooter. The goalie uses his stick to intercept any passing attempts across ice that are happening close to the goal (Suomen jääkiekkoliitto 2006).

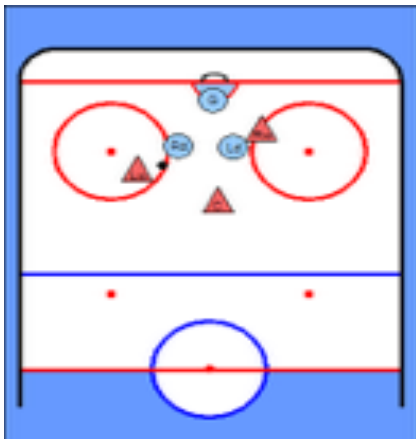


Figure 6. How to defend 3-on-2 rush (Suomen jääkiekkoliitto 2006)

4.2.4. How to defend 3-on-1 rush

The defensive player positions himself in the middle of the three offensive players and is active with his stick trying to give pressure to the puck carrier while at the same time trying interfere any passing attempts across the ice. No matter how this situation plays out, the defensive player needs to defend at least one offensive player until the end of the situation (Suomen jääkiekkoliitto 2006).

The goalie plays this situation conservatively and does not come out aggressively. The goalie uses his stick to intercept any passing attempts across the ice that are happening close to the goal. The goalie should also pay attention to other offensive players, and be aware of their positioning all the time (Suomen jääkiekkoliitto 2006).



Figure 7. How to defend 3-on-1 rush (Suomen jääkiekkoliitto 2006)

4.2.5. Penalty kill

In shorthanded situation the players main goal is to slow the power play down, block shots, prevent a straight shot from a good scoring sector, prevent a cross ice pass through the defensive teams formation on the ice and to clear any loose pucks and rebounds. If the puck is played to the point man, and the goalie comes out aggressively and plays against the shooter, then the players need to take out all the attackers and make sure that they cannot deflect the shot or get a shot from a rebound (Suomen jääkiekkoliitto 2006).

The goalie is responsible of seeing the puck at all times, he makes the save and controls any loose pucks if necessary. The goalie should also pay attention to the non-puck carriers, and be aware of their positioning at all times and preferably even know which side the opponents players shoot from. He gives the defensive players instructions during the penalty kill if they are not positioned correctly. If the puck is played to the point man and the point man has a clear shot, then the goalie comes out aggressively and plays against the shooter (Suomen jääkiekkoliitto 2006).



Figure 8. Penalty kill (Suomen jääkiekkoliitto 2006)

4.3. Other defensive situations

This chapter includes defensive situations that can happen with even or uneven number of players. These situations require good communication between the players and the goalie and also ability to read the game and make quick decisions (Suomen jääkiekkoliitto 2006).

4.3.1. A loose puck

In a situation when a loose puck is close to the goal, or the opponent team has shot the puck towards the goal and there is a loose puck close to the goal, it is crucial for the goalie and the player to communicate with each other. In a situation where there is a loose puck and there are no offensive players nearby, the goalie should be used as a "third defenseman" to play the puck (Suomen jääkiekkoliitto 2006).



Figure 9. A loose puck (Suomen jääkiekkoliitto 2006)

4.3.2. Puck in the possession of the goalie behind the net

If the goalie gets in possession of the loose puck, he should try to pass the puck quickly to one of the players in order for their team to breakout quickly. A quick breakout enables the team to attack against an unorganized defense which gives them a better chance to break the defense (Suomen jääkiekkoliitto 2006).

The players responsibility is to give the goalie instructions where to play the puck and to avoid a possible threat from an offensive player. In many situations the goalie is not

facing the open ice when he obtains the possession of the puck but is facing the boards and does not know what is happening behind him. In these situations it is important that the players will give the goalie clear and simple instructions what to do for example shoot, pass or leave (Suomen jääkiekkoliitto 2006).



Figure 10. Puck in the possession of the goalie behind the net (Suomen jääkiekkoliitto 2006)

4.3.3. Goalie being screened

When the opponent's players are trying to screen the goalie, the defensive players make sure that the goalie can see the puck without disturbance, they try to block the shot, prevent any deflections and clear any rebounds and loose pucks. If there is a rebound situation close to the goal, the goalie plays the puck, but if the puck is out of the goalies reach, then the players clear the puck. Every team should agree among themselves how to block shots. For instance some teams agree that all shots should be blocked if they are coming from the ringette-line or closer. This way the defensive formation stays compact and everyone knows their responsibilities (Suomen jääkiekkoliitto 2010).



Figure 11. Goalie being screened (Suomen jääkiekkoliitto 2006)

4.3.4. Goalie coming out aggressively

If the goalie decides to come out aggressively, for instance outside the goal grease, to challenge a shooter from the point. In this defensive situation the players need to react to the goalies movements. In this situation the players main responsibility is keeping the offensive players off the rebounds, preventing cross ice passes to good scoring sectors and preventing deflections. This means aggressive man-on-man defense from the defensive players. This situation is very common in a penalty kill (Suomen jääkiekkoliitto 2010).



Figure 12. Goalie coming out aggressively (Suomen jääkiekkoliitto 2006)

4.3.5. How to defend rebounds

The defensive players keep the opponents off the rebound allowing the goalie to cover the pucks in front of the net. If the puck bounces out of the goalies reach, then it is the players responsibility to clear the puck out of the scoring area. The goalie needs to keep eye contact to the puck, even if there is heavy traffic in front of the net (Suomen jääkiekkoliitto 2006).



Figure 13. How to defend rebounds (Suomen jääkiekkoliitto 2006)

5. Empirical work

5.1. Project planning

Our interest in this project initially began when we met Hannu Nyqvist who was at the time the head of goalie coaching at the Finnish Ice Hockey Associations. We met Hannu during our fall semester in 2012 at the Sports Institute of Finland in Vierumäki where we were studying. Hannu explained to us that he had an idea for a project, and that we could use that project as a part of our thesis. He presented us an idea of doing a video tool for cooperation between players and goalies, something that he had wanted to do for a long time. There had been other students in the past trying to make that project come to life, but they had not succeeded.

Hannu wanted to create an internet web page for the International Ice Hockey Centre of Excellence. This web page would contain videos and simple instructions demonstrating how the cooperation between goalies and players should be executed. The idea was to improve the knowledge of the subject among everyone involved in ice hockey in Finland. This subject appealed to both of us of course, because we were both former goalies and currently working as goalie coaches in our ice hockey clubs. We both had struggled with this problem in the past, trying to make the cooperation between goalies and players better. Suddenly here was a concrete way to make it happen for every Finnish ice hockey player and goalie. We discussed about the possibility of doing this project as a part of our thesis with our thesis instructor Markus Arvaja. Markus familiarized himself with the project and gave us a permission to go ahead with the project as our thesis topic.

Now we had an idea for a thesis project. Of course we had to make a plan how to approach the subject and we also needed a schedule. During fall 2012 we had a meeting with Hannu where we talked about the project, made a rough project plan and project schedule. We also discussed about the layout of the upcoming web page, but Hannu told us that an IIHCE employee named Robert Andersen was the person who was working on the IIHCE web pages, and we should talk to him about the technical part of the project. Robert had already created the web site, but he was missing text and all of the video clips that were to be used as demos on the web site.

Robert gave us video footage from Finland's U-20 national team games, which were filmed during the season 2011-2012. Our job was to find specific video clips that would support the aim of the project. These video clips contained a various number of different defensive situations. Robert was also our mentor in the technical part of the thesis. He has an enormous amount of knowledge on computers and other technical equipment such as video cameras and electronics. We spent hours with Robert trying to figure out what would be the best video editing software, how the video clips should be uploaded to Roberts's computer and how to improve the video quality in some video clips. After long discussions with Robert we decided to use iMovie. iMovie is a very popular free video editing software application sold by Apple inc. (Apple inc. 2014).

We also had to make a plan how we would get the finalized videos to Robert, because we were working on the project in Helsinki and Robert was in Vierumäki. We agreed to use Dropbox. Dropbox is a popular file sharing and storage operated by Dropbox Inc (Dropbox Inc. 2014). Robert told us that the best way to get the video files to him would be uploading them to Dropbox. Then he could download the video clips from Dropbox to his computer.

5.2. Project implementation

All of the game videos that we used in our project were on DVD:s. This presented us with a challenge, on how to download the video clips from the DVD:s on to our computer. Robert was our mentor when we had to learn how to download the DVD footage to our computer. First we had to import the video files from the DVD into iMovie, then we created a video from each game. When all games were imported to iMovie, we could start the actual editing. The editing consisted of us watching through all of the game videos, and then hand-picking the right defensive situations from the footage. After we had edited the video clips, we had to export the finalized video as a Final Cut XML-file and upload it to Dropbox so Robert could access it.

We decided to use iMovie as the video editing software, because it was simple and easy to use, but it still had enough options and features that we needed for our editing purpose. Also Robert was at the time using Apple's iMac as his computer, therefore Apple's iMovie would be compatible with his computer.

When a clip was edited from the actual game footage, we had to create a new movie project in iMovie for that video. Every clip that we edited had to be made into an individual movie project. When we made these movie-projects, we naturally had to give them names. This presented us with the challenge to name the movie project in a way that could be somehow recognized and understood by Robert. It had to be individual and recognizable. When we eventually would finalize the movie and send it to Robert, he would automatically see from the name what that movie would consist of. Robert solved the problem by giving us a chart where he had created a reference number for each movie. We named each movie with its own reference number. That way Robert could identify each movie from its name and easily know what it was about and where it belonged on the web page.

When we started writing the instructions for the IIHCE web page we agreed with Robert that we should use the same reference number chart for each text that we wrote. When we had produced a text for a certain subject, we would name it with its own reference number and send it to Robert. Before we started to write the instructions we had a discussion about the text editing software that would be used to create the text. Robert told us that the most simple and efficient way to do it, was to use Apple Inc.'s TextEdit software. TextEdit is a text editing software application sold by Apple inc. (Apple inc. 2014). We then sent the ready material to Robert via e-mail.

We started writing the theory part in January 2014. We began with the chapter on Cooperation between goalies and players. We had already gathered material on that subject and we also had material from the Finnish ice hockey federation that we could use for our thesis. After finishing that chapter, we started to write the introduction and after that we wrote the theory part in chronological order. One of our thesis instructors Mika Vähälummukka had the idea that we should write an analysis of the sport of ice hockey and then move into the more detailed part of our project. We intended to give the reader a good overall picture on the cooperation between goalies and players

with enough back up information on ice hockey, that it would make a solid comprehensive reading experience even for someone who was not an ice hockey person.

6. Discussion

The aim of this thesis is to teach and to demonstrate how different defensive situations should be coordinated between players and goalies in ice hockey. We also wanted to emphasize how important it is to coordinate your defensive play properly. When we started this project we discovered how little knowledge there was concerning this issue. There were bits and pieces of information scattered in books and on different web sites, but we couldn't find a comprehensive piece anywhere. We hope that our work would inspire others to start working on the coordination of defensive play and produce different kind of material in that field. Even though we had most of our material from the Finnish ice hockey federation, it would have been good to broaden our view by learning from other material on this subject.

This project was a huge undertaking for both of us. Finding the right clips from hours and hours of game footage was an exhausting job. In hindsight it would have been a lot easier task to film all of the defensive situations ourselves at the Sports Institute of Finland in Vierumäki. We would have had the ice hockey rink to film the clips and the technical knowhow of Robert Andersen right there at our disposal. Also this way we could have made the clips perfect. There is always a problem with finding the right defensive situations from an actual game footage. Those situations are often not played just the way you want to portray them on your web page. There are also other problems with using prerecorded video footage. You cannot influence the video quality the game has been filmed in. In some cases Robert tried to improve the quality of the videos, but you can never get the same quality that you could get if you would film the videos yourself. There was also a problem with the camera angles. Some games were filmed from high above where you can see a big portion of the ice and therefore get a better perspective of the defensive play. Some videos were filmed very close to the ice surface and that restricted the viewing angle.

Our project manager Hannu Nyqvist was very helpful throughout this project. He was always at our disposal and was very keen on helping to bring this project forward. Also Robert Andersen was very generous with his time whenever we needed his advice or his actual presence. He took the time from his busy schedule to mentor us with the technical aspects of the project. The challenges that we faced were almost exclusively

involved with working long distance, especially with making the videos. There were many occasions where it would have been very beneficial for us to be located in Vierumäki.

Although we believe that all of the material presented in this thesis is valid, ice hockey is a sport that is forever evolving. The evolution of the equipment, technology, improvement in the training methods and constantly changing rules will change the game in the future. All of these factors also affect the way the game is played offensively and defensively. This is why it is crucial to update our thinking and our knowledge on the cooperation between players and goalies. That is the only way to really ensure a successful cooperation between players and goalies also in the future.

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